A.D. 1875, *3rd February.* N° 399.

SPECIFICATION

OF

GEORGE RYDILL.

TREATING SEWAGE.

LONDON:
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A.D. 1875, *3rd February.* N° 399.

Treating Sewage.

LETTERS PATENT to George Rydill, of 8, Quality Court, Chancery Lane, in the County of Middlesex, for the Invention of "Improvements in the Process of and Apparatus for Treating and Purifying Sewage and Polluted Waters, which Improvements are Applicable for Collecting the Soap, Grease, and Oils for the Manufacture of Gas and for Removing Incrustation in Steam Boilers."

Sealed the 25th March 1875, and dated the 3rd February 1875.

PROVISIONAL SPECIFICATION left by the said George Rydill at the Office of the Commissioners of Patents, with his Petition, on the 3rd February 1875.

I, George Rydill, of 8, Quality Court, Chancery Lane, in the County of Middlesex, do hereby declare the nature of the said Invention for "Improvements in the Process of and Apparatus for Treating and Purifying Sewage and Polluted Waters, which Improvements are Applicable for Collecting the Soap, Grease, and Oils for the Manufacture of Gas and for Removing Incrustation in Steam Boilers," to be as follows:—

This Invention of improvements is for the treatment of sewage and dye waters for preventing the pollution of rivers and streams, and may be carried out in several ways, which are intended to be worked in conjunction with my improvements in machinery and apparatus in the construction and working of vessels, tanks, reservoirs, areas, and materials used for the purification of sewage and other polluted waters named in my Specification dated January 14th 1875, No. 150.

As it is my intention to embrace the workings of nature as much as possible in this Invention of improvements for the purification of sewage and polluted waters, I will remark that I am acquainted with the river Calder, and at a certain part of its stream this river is so contaminated with sewage and dye waters that no fish can live in it. After the said waters have passed over three weirs and travelled the distance of four miles the matter is so oxidized that fish may be seen living in the water and supporting the higher orders of animal and vegetable life.

I have also in experiments imperfectly filtered sewage waters, and by the action of air brought in contact with the imperfectly filtered water caused the said water to be void of any appearance of once being sewage water. I give this description of the workings of polluted river water, and my experiments with sewage and polluted waters, in order that I may clearly explain how polluted waters have been by nature purified, also experimentally treated and purified without the application of any added chemicals simply by filtering under vacuum and pressure through clean sieved coal fire ashes of dwellings or furnaces, and then subjecting the water to the action of the air by blowing or forcing air through the filtered water to supply oxygen to the decomposed organic matter, after which a fish has lived in the water.

In describing this Invention of improvements I feel it my duty clearly to explain how sewage is contaminated with several most valuable substances. It is well known that in all towns sewage is impregnated with soap, greasy, and oily waters. In woollen districts, soap and oily matters from fulling mills run into the sewers and streams, which only serve to assist decomposition and to create noxious gases.

There are several important reasons for utilising and collecting these soapy, greasy, and oily waters from dwellings and factories, both sanitary and also valuable for the manufacture of gas of great illuminating power, preventing the fatty acids combining with the earthy salts in the water to form insoluble soaps, and slimy scum which, having once become mixed with sewage and polluted waters would soon cause porous filter beds to be made up. By collecting these soapy, greasy, and oily waters, the porous filter beds work more rapid, better, and longer, causing filteration of sewage and polluted streams to be successfully worked, both under vacuum and pressure, also causing irrigation the same as filteration to be worked more successfully.

At present the polluted and fatty acid waters combine with the earthy salts in the sewage, and on lands forming insoluble soaps and slimy scum, which give off unpleasant odours and injurious gases, both in the sewers, rivers, streams, and on lands, causing grass and other cultivated lands irrigated with sewage containing these fatty acids and insoluble soaps, on which cattle have to graze, to be unpleasant to the taste and unhealthy for cattle to graze upon. I prefer to collect the soap and greasy waters of factories and at dwellings by running them direct from the sink or slop stone on to a filter bed of sieved, ground, or crushed ashes, cinders, or scale, known as coal fire ashes, either from dwellings, steam boiler or other furnaces, or through ground or crushed clinkers, rubbish, brick pieces, stones, earthenware, earths, dust, refuse barks, and other refuse substances, refuse animal charcoal, dross, shrive, allum, shale, and other porous substances.

Coal fire ashes being of little or no value I prefer the adoption of their use, so that which is now a worthless refuse becomes a useful agent as a purifier of polluted waters when used for purposes of filteration. It is important to keep the ashes dry in a box under cover, free from decayed substances. The filter vessel may be made of any required dimensions, containing a perforated bottom; or a filter vessel having a chamber, as described in my Specification dated January 14th 1875, No. 150, may be used and placed at any convenient place in the yard. The clear water run from the filter bed may be conducted into the closet instead of direct into the drain.

Collecting and removing these soapy, greasy, and oily waters, so that they do not pass into the drains and sewers will considerably reduce those unpleasant odours and injurious sewage gases known to accumulate in the sewers, and so improve the health of towns.

By running the soap and greasy waters from the sink or slop stone on to the filter bed, the sink or slop stone pipe does not form a direct communication with the drains and sewers, so the noxious gases are prevented from escaping into the dwellings. I prefer to erect two filter vessels in the yard, one connected with the sink or slop stone, to filter the soap and greasy waters; and the other for dirty waters, not contaminated with soap or grease. This arrangement allows the soap and grease collected on the filter to be more free from dirt for the manufacture of gas or for other purposes, which is collected by scraping off the soap and grease from the top of the filter bed, which filter vessels may be covered over with a pierced lid. This method of preventing the soap and greasy waters entering the drains and sewers will prevent the sides of the sewers from being heaped up with slimy matter and offensive rubbish, so that flushing of the sewers will be less frequent.

As it may be long before sanitary authorities are disposed to adopt the aforesaid improvements of collecting the soap, grease, and oil in the waters from dwellings for the manufacture of gas, preservation of health, and keeping the drains and sewers cleaner, I therefore treat the whole of the mixed impurities of sewage and polluted waters as they are at present collected in the sewers of towns.

In order to prevent the porous filter beds from making up in the vessels, tanks, reservoirs, and areas from the fatty acids, insoluble soaps, and slimy scum, I first precipitate in a tank or in one of my improved filter vessels, tanks, reservoirs, and areas, as described in my Specification of January 14th, 1875, No. 150, the mixed sewage and polluted waters; also acid dye waters with caustic soda liquid, which precipitates the heavy impurities; or clear lime water from washed lime may be used, according to the mixed contamination of the sewage waters.

In manufacturing districts where much acid liquids pass into the sewage caustic soda liquid may be used to precipitate. In other parts of the country where few acids become mixed with sewage and polluted waters, caustic soda and clear lime water may be used combined, or clear lime water alone may be used. When the heavy matters are precipitated the clear top water is run into the filter vessel, tank, reservoir, or area to be filtered, and having passed through one filter bed may afterwards pass upwards or downwards through other filter beds, in order to purify and remove organic matter as much as possible.

In many of the manufacturing districts in the country the streams forming a water supply for steam boilers and condensing engines are highly polluted with sewage and dye waters. The dye waters are impregnated with sulphuric, muriatic, nitric, and other acids, as well as other impurities. Such sewage and polluted waters are mostly used for condensing the steam in condensing steam engines. Supplying the steam boilers with water in a polluted condition causes the bottom of steam boilers to be heavily charged with dark impure substances, causing boilers to prime and valves to choke up.

To purify the said sewage and polluted waters I treat them with caustic soda liquid in a vessel, tank, or reservoir, to precipitate the heavy substances. I then pass the clear top water through a filter of sieved ground or crushed ashes, so that the filtered waters are perfectly clear. This method of treating sewage and polluted waters prevents soap, greasy, and oily waters from passing into the steam boilers to form insoluble soapy matters with the lime salts present in the water forming a deposit and incrustation. The sewage and polluted waters may be treated with caustic soda before or after they pass into the hot well.

Treating sewage and polluted waters with caustic soda liquid not only precipitates the said dye colouring matters, but after filtering the same it prevents priming in steam boilers and removes incrustation.

I have now described in what manner I procure clear water from sewage and polluted streams, but as soap and grease collects in the drains and sewers with other refuse matters, polluted waters do from many causes, such as drains not always being in use, so that stagnant polluted waters remain for days or weeks together, by which the organic matter becomes decomposed, and depriving the water of oxygen renders it impossible for the higher organisms to live in it unless it absorbs from the atmosphere enough oxygen to replace that consumed. It is almost impossible to remove entirely by filteration all trace of such contamination, so that the matter requires to be oxidized to cause the waters to be unobjectionable for use. I therefore pass the waters which have been filtered or cleared into a reservoir or channel of any required depth, but I prefer it not so deep when the saving of power is of moment. I place along the reservoir or channel bottom, or near its bottom, perforated pipes, which may be lengthways or crossways. The ends of the perforated pipes are unpierced, so that they may pass through the side or sides or end of the reservoir or channel, which may be made up with a moveable plate. The perforated pipes fixed near to or along the bottom may be connected with each other or kept separate, and I connect to the perforated pipe ends passing through the side or sides of the reservoir or channel, or up the end of the reservoir or channel, with a fan or fans of sufficient power to force air through the perforated pipe openings; or an air pump or engine may be used to force the air first into a large wrought-iron air vessel connected to the perforated pipe or pipes; or the air pump or engine may pump the air direct into and through the pierced pipe openings to agitate and rise through the filtered waters.

In order to make it clearly understood, I will describe the air forcing machine as being a fan, and by any suitable motive power, I force air with the fan into the end or ends of the pipe or pipes which are connected to the fan, causing the air to be forced through the perforated openings in the pipes, causing the filtered waters run into the reservoir or channel to become agitated by the air passing through the waters, which gives them the appearance of boiling water in a vessel, causing any decomposed matter in the water to be so oxidized by being brought in contact with the air that fish will live in the water, which is a guarantee of its purity. The filtered waters may be thus treated to purify them as they slowly pass through the reservoir or channel from the purifying works, or I draw or force the air previous to passing through the perforated pipes in the reservoir or channel through lime water, caustic soda water, or through a retort connected with one in which charcoal is heated, or through sulphuric acid, or other acid waters or gases; or chemical waters may be used to create precipitation and purification of polluted waters; or I precipitate the heavy matters in sewage by running the sewage matters into a vessel, tank, or reservoir containing perforated pipes by forcing the air previously passed through caustic soda, lime, or sulphuric acid chemical waters into the sewage waters; when, on the air ceasing to agitate the sewage and polluted waters, precipitation at once commences to take place. When sufficiently settled the clear water is run off to be further cleared by filteration. Or instead of agitating the clear filtered waters with air, a shaft or shafts with arms may be fixed in suitable bearings in the reservoir or channel, so as to agitate and cause the waters to be brought in contact with the air, but I prefer to pass the air through the pierced pipes as described.

In order that the purification of sewage and polluted waters may be carried on in a severe frost I pass heated air through the perforated pipes, or the waste products of combustion from furnaces or chemical works may be forced through the perforated pipes to act upon and prevent the sewage and polluted waters being frozen.

To cheapen the use of the materials used for precipitation, and for some polluted waters, the caustic soda liquid, lime water, and sulphuric acid may be mixed together instead of using them separately.

SPECIFICATION in pursuance of the conditions of the Letters Patent, filed by the said George Rydill in the Great Seal Patent Office on the 3rd August 1875.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, GEORGE RYDILL, of 8, Quality Court, Chancery Lane, in the County of Middlesex, send greeting.

WHEREAS Her most Excellent Majesty Queen Victoria, by Her Letters Patent, bearing date the Third day of February, in the year of our Lord One thousand eight hundred and seventy-five, in the thirty-eighth year of Her reign, did, for Herself, Her heirs and successors, give and grant unto me, the said George Rydill, Her special licence that I, the said George Rydill, my executors, administrators, and assigns, or such others as I, the said George Rydill, my executors, administrators, and assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel Islands, and Isle of Man, an Invention for "IMPROVEMENTS IN THE PROCESS OF AND APPARATUS FOR TREATING AND PURIFYING SEWAGE AND POLLUTED WATERS, WHICH IMPROVEMENTS ARE APPLICABLE FOR COLLECTING THE SOAP, GREASE, AND OILS FOR THE MANUFACTURE OF GAS AND FOR REMOVING INCRUSTATION IN STEAM BOILERS," upon the condition (amongst others) that I, the said George Rydill, my executors or administrators, by an instrument in writing under my, or their, or one of their hands and seals, should particularly describe and ascertain the nature of the said Invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said Letters Patent.

NOW KNOW YE, that I, the said George Rydill, do hereby declare the nature of my said Invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This Invention of improvements is for the treatment of sewage and dye waters for preventing the pollution of rivers and streams, and may be carried out in several ways which are intended to be worked in conjunction with my improvements in machinery and apparatus in the construction and working of vessels, tanks, reservoirs, areas, and materials used for the purification of sewage and other pulluted waters named in my Specification dated January Fourteenth, One thousand eight hundred and seventy-five, Number 150.

As it is my intention to embrace the workings of nature as much as possible in this Invention of improvements for the purification of sewage and polluted waters, I will remark that I am acquainted with the river Calder, and at a certain part of its stream this river is so contaminated with sewage and dye waters that no fish can live in it. After the said waters have passed over three weirs and travelled the distance of four miles the matter is so oxidized that fish may be seen living in the water and supporting the higher orders of animal and vegetable life.

I have also in experiments imperfectly filtered sewage waters and by the action of air brought in contact with the imperfectly filtered water caused the said water to be void of any appearance of once being sewage water. I give this description of the workings of polluted river water and my experiments with sewage and polluted waters in order that I may clearly explain how polluted waters have been by nature purified, also experimentally treated, and purified without the application of any added chemicals, simply by filtering under vacuem and pressure through clean sieved coal fire ashes of dwellings or furnaces, and then subjecting the water to the action of the air by blowing or forcing air through the filtered water to supply oxygen to the decomposed organic matter after which a fish has lived in the water.

In describing this Invention of improvements I feel it my duty clearly to explain how sewage is contaminated with several most valuable substances. It is well known that in all towns sewage is impregnated with soap, greasy, and oily matters. In woollen districts soap and oily waters from fulling mills run into the sewers and streams which only serve to assist decomposition and to create noxious gases.

There are several important reasons for utilising and collecting the soapy, greasy, and oily waters from dwellings and factories, both sanitary and also valuable for the manufacture of gas of great illuminating power, preventing the fatty acids combining with the earthy salts in the water to form insoluable soaps and slimy scum, which having once become mixed with sewage and polluted waters would soon cause porous filter beds to be made up. By collecting these soapy, greasy, and oily waters, the porous filter beds work more rapid, better, and longer, causing filtration of sewage and polluted streams to be successfully worked, both under vacuum and pressure, also causing irrigation the same as filtration to be worked more successfully.

At present the polluted and fatty acid waters combine with the earthy salts in the sewage and on lands, forming insoluble soaps and slimy scum which give off unpleasant odours and injurious gases, both in the sewers, rivers, streams, and on lands, causing grass and other cultivated lands irrigated with sewage containing these fatty acids and insoluble soaps, on which cattle have to graze, to be unpleasant to the taste and unhealthy for cattle to graze upon. I prefer to collect the soap and greasy waters of factories and at dwellings by running them direct from the sink or slop stone on to a filter bed of seived, ground, or crushed ashes, either from dwellings steam boiler or other furnaces, or through ground or crushed clinkers, rubbish, brick pieces, stones, earthenware, earths, dust, refuse barks, and other refuse substances, refuse animal charcoal, dross, shieve, allum, shale, and other porous substances.

Coal fire ashes being of little or no value I prefer the adaptation of their use, so that which is now a worthless refuse becomes a useful agent as a purifier of polluted waters when used for purposes of filtration. It is important to keep the ashes dry in a box under cover, free from decayed substances. The filter vessel may be made of any required dimensions, containing a perforated bottom, or a filter vessel having a chamber, as described in my Specification dated January Fourteenth, One thousand eight hundred and seventy-five, Number 150, may be used and placed at any convenient place in the yard. The clear water run from the filter bed may be conducted into the closet, instead of direct into the drain.

Collecting and removing these soapy, greasy, and oily waters so that they do not pass into the drains and sewers will considerably reduce those unpleasant odours and injurious sewage gases known to accumulate in the sewers, and so improve the health of towns.

By running the soap and greasy waters from the sink or slop stone on to the filter bed the sink or slop stone pipe does not form a direct communication with the drains and sewers, so the noxious gases are prevented from escaping into the dwellings. I prefer to erect two filter vessels in the yard, one connected with the sink or slop stone to filter the soap and greasy waters, and the other for dirty waters not contaminated with soap or grease. This arrangement allows the soap and grease collected on the filter to be more free from dirt for the manufacture of gas or for other purposes, which is collected by scraping off the soap and grease from the top of the filter bed, which filter vessels may be covered over with a pierced lid. This method of preventing the soap and greasy waters entering the drains and sewers will prevent the sides of the sewers from being heaped up with slimy matter and offensive rubbish, so that flushing of the sewers will be less frequent.

As it may be long before sanitary authorities are disposed to adopt the aforesaid improvements of collecting the soap, grease, and oil in the waters from dwellings for the manufacture of gas, preservation of health, and keeping the drains and sewers cleaner, I therefore treat the whole of the mixed impurities of sewage and polluted waters as they are at present collected in the sewers of towns.

In order to prevent the porous filter beds from making up in the vessels, tanks, reservoirs, and areas from the fatty acids, insoluble soaps, and slimy scum, I first precipitate in a tank or in one of my improved filter vessels, tanks, reservoirs, and areas, as described in my Specification of January Fourteenth, One thousand eight hundred and seventy-five, No. 150, the mixed sewage and polluted waters, also acid dye waters with caustic soda liquid, which precipitates the heavy impurities, or clear lime water from washed lime may be used according to the mixed contamination of the sewage waters.

In manufacturing districts where much acid liquids pass into the sewage, caustic soda liquid may be used to precipitate. In other parts of the country where few acids become mixed with sewage and polluted waters caustic soda and clear lime water may be used combined, or clear lime water alone may be used. When the heavy matters are precipitated the clear top water is run into the filter vessel, tank, reservoir, or area to be filtered, and having passed through one filter bed may afterwards pass upwards or downwards through other filter beds in order to purify and remove organic matter as much as possible.

In many of the manufacturing districts in the country the streams forming a water supply for steam boilers and condensing engines are highly polluted with sewage and dye waters. The dye waters are impregnated with sulphuric, muriatic, nitric, and other acids, as well as other impurities. Such sewage and polluted waters are mostly used for condensing the steam in condensing steam engines. Supplying the steamer boilers with water in a polluted condition causes the bottom of steam boilers to be heavily charged with dark impure substances, causing boilers to prime and valves to choke up.

To purify the said sewage and polluted waters I treat them with caustic soda liquid in a vessel, tank, or reservoir to precipitate the heavy substances. I then pass the clear top water through a filter of sieved, ground, or crushed ashes, so that the filtered waters are perfectly clear. This method of treating sewage and polluted waters prevents soap, greasy, and oily waters from passing into the steam boilers to form insoluble soapy matters with the lime salts present in the water, forming a deposit and incrustation. The sewage and polluted waters may be treated with caustic soda before or after they pass into the hot well.

Treating sewage and polluted waters with caustic soda liquid not only precipitates the said dye coloring matters, but after filtering the same it prevents priming in steam boilers, and removes incrustation.

I have now described in what manner I procure clear water from sewage and polluted streams, but as soap and grease collects in the drains and sewers with other refuse matters, polluted waters do from many causes, such as drains not always being in use, so that stagnant polluted waters remain for days or weeks together, by which the organic matter becomes decomposed, and depriving the water of oxygen renders it impossible for the higher organisms to live in it, unless it absorbs from the atmosphere enough oxygen to replace that consumed. It is almost impossible to remove entirely by filteration all trace of such contamination, so that the matter requires to be oxidized to cause the waters to be unobjectionable for use. I therefore pass the waters which have been filtered or cleared into a reservoir or channel of any required depth, but I prefer it not so deep when the saving of power is of moment. I place along the reservoir or channel bottom, or near its bottom, perforated pipes, which may be lengthways or crossways. The ends of the perforated pipes are unpierced, so that they may pass through the side or sides or end of the reservoir or channel, which may be made up with a moveable plate. The perforated pipes fixed near to or along the bottom may be connected with each other or kept separate, and I connect to the perforated pipe ends passing through the side or sides of the reservoir or channel or up the end of the reservoir or channel with a fan or fans of sufficient power to force air through the perforated pipe openings; or an air pump or engine may be used to force the air first into a large wrought-iron air vessel connected to the perforated pipe or pipes, or the air pump or engine may pump the air direct into and through the pierced pipe openings to agitate and rise through the filtered waters.

In order to make it clearly understood I will describe the air forcing machine as being a fan, and by any suitable motive power I force air with the fan into the end or ends of the pipe or pipes which are connected to the fan, causing the air to be forced through the perforated openings in the pipes, causing the filtered waters to run into the reservoir or channel to become agitated by the air passing through the waters, which gives them the appearance of boiling water in a vessel, causing any decomposed matter in the water to be so oxydized by being brought in contact with the air that fish will live in the water, which is a guarantee of its purity. The filtered waters may be thus treated to purify them as they slowly pass through the reservoir or channel from the purifying works, or I draw or force the air previous to passing through the perforated pipes in the reservoir or channel through lime water, caustic soda water, or through a retort connected with one in which charcoal is heated, or through sulphuric acid or other acid waters or gases; or chemical waters may be used to create precipitation and purification of polluted waters; or I precipitate the heavy matters in sewage by running the sewage waters into a vessel, tank, or reservoir containing perforated pipes by forcing the air previously passed through caustic soda, lime, or sulphuric acid chemical waters into the sewage waters, when on the air ceasing to agitate the sewage and polluted waters precipitation at once commences to take place. When sufficiently settled the clear water is run off to be further cleared by filteration; or instead of agitating the clear filtered waters with air a shaft or shafts with arms may be fixed in suitable bearings in the reservoir or channel so as to agitate and cause the waters to be brought in contact with the air, but I prefer to pass the air through the pierced pipes, as described.

In order that the purification of sewage and polluted waters may be carried on in a severe frost I pass heated air through the perforated pipes, or the waste products of combustion from furnaces or chemical works may be forced through the perforated pipes to act upon and prevent the sewage and polluted waters being frozen.

To cheapen the use of the materials used for precipitation and for some polluted waters, the caustic soda liquid, lime water, and sulphuric acid may be mixed together instead of using them separate.

Having now described the nature and particulars of my said Invention, and the manner in which the same is to be performed, I desire it to be understood that I claim,—

First. The forcing of air by means of a fan or blowing engine through the filtered water to supply oxygen to the decomposed organic matter through pierced or perforated pipes fixed under water, which may be connected to an air vessel, for the purposes as described.

Second. Collecting the soap, grease, and oil on a filter for the manufacture of gas.

Third. To precipitate heavy impurities in sewage, dye, and polluted waters, as fully explained, with caustic soda or clear lime water, used either singly or combined, removing incrustation in steam boilers, purifying waters, after which the same may be filtered.

Fourth. Forcing air through lime water, caustic soda, or sulphuric acid water for the purposes of purification of water and precipitation.

Fifth. And for forcing the heated products of combustion, as described, through pierced pipes into polluted waters, as well as air passed over heated charcoal.

In witness whereof, I, the said George Rydill, have hereunto set my hand and seal, this Second day of August, in the year of our Lord One thousand eight hundred and seventy-five.

GEORGE RYDILL. (L.S.)

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